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ABSTRACT

This study investigated the relative effects of kindergarten experience for boys and girls, based on considerable evidence that there is a developmental difference between the sexes around 5. Emphasis is in the areas of language and readiness skills, which are traditionally not evaluated until the end of kindergarten. Groups of 93 boys and 89 girls, matched for chronological age, were tested with the Metropolitan Readiness Test and the Illinois Test of Psycholinguistic Abilities during the summer before their 5th birthday and again 1 year later. One group attended kindergarten during the year; the other did not. Analysis of results indicates that 5-year-old girls are superior to boys in language and readiness skills prior to kindergarten entrance. Kindergarten programs, however, have a differential effect on gains in these skills for the sexes, as the experience led to greater positve changes for boys than for girls. This finding is discussed in terms of an interaction between developmental readiness and educational programs. It is concluded that goals and practices of early childhood education programs must be re-evaluated, with greater stress on sex differences and flexible entrance and promotion policies. (DP)

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SEX DIFFERENCES IN EFFECTS OF KINDERGARTEN ATTENDANCE ON DEVELOPMENT OF SCHOOL READINESS AND LANGUAGE SKILLS

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RESEARCH AND DEVELOPMENT CENTER
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The University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children has been established to concentrate on intervention strategies and materials which develop and improve language and communication skills in young handicapped children.

The long term objective of the Center is to improve the language and communication abilities of handicapped children by means of identification of linguistically and potentially linguistically handicapped children, development and evaluation of intervention strategies with young handicapped children and dissemination of findings and products of benefit to young handicapped children.

Abstract

The Metropolitan Readiness Tests and the Illinois Test of Psycholinguistic Abilities were administered to 182 children at a mean CA of 4-9 and readministered one year later. During the intervening year 76 of these subjects attended kindergarten while 106 did not. Comparisons of kindergarten attenders vs. non-attenders indicated a sex differential in impact of kindergarten programs on growth of language and readiness skills. Males who attended kindergarten showed significantly greater ($p < .01$) growth on the variables under investigation than did male non-attenders whereas, for females increases in these skills during the year between initial and final testing could not be attributed to any special influence of kindergarten education.

Sex Differences in Effects of Kindergarten Attendance on Development of School Readiness and Language Skills

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Review

Though educators have long stressed the necessity for adapting instruction to the developmental needs and capacities of children, the widely recognized developmental age differential between the sexes is almost universally ignored in educational planning for children in their early school years.

Neglect of sex differences in planning of school programs has occurred despite an extensive body of research evidence (1-5) reinforced by innumerable personal testimonials from kindergarten and first grade teachers, supporting the position that girls tend to enter school more ready for learning activities than their male age-mates.

In a longitudinal study of developmental criteria for school entrance involving over 900 subjects from kindergarten through second grade Ilg and Ames (1964) found girls ahead of boys in readiness particularly from ages five to six. These same authors studied 39 girl-boy pairs matched for age, IQ, and socioeconomic status of parents over a period of three years concluding that, "The test performance of girls in the five-to-nine-year-old range

appears to be considerably advanced over that of boys in the same age range [p. 33]." Bentzen (1963) stressed the biosocial immaturity of the male as the major factor in the male predominance in learning and behavior disorders.

Since an important goal of kindergarten education is furthering the development of language and readiness skills (Robinson & Spodek, 1967; Wills & Lindberg, 1967), a concern for adapting to individual as well as sex group variations in developmental levels should necessitate careful evaluation of these abilities in children entering such programs. However, academic skills and aptitudes typically are not evaluated until completion of kindergarten as illustrated by the fact that the most widely used school readiness measures, the Gates Reading Readiness Tests (Gates, 1942) and the Metropolitan Readiness Tests (Hildreth, Griffiths, & McGovern, 1965) fail to provide normative data on children prior to the last month of the kindergarten year. Previous research (Rubin & Balow, 1968) found that the range of Metropolitan Readiness Test scores obtained by children during the summer prior to kindergarten entrance extended up to the 88th percentile on norms for pupils beginning first grade, with 15% of girls and 8% of boys scoring at or above the "average" range resulting in a prognosis of likely to succeed in first grade work.

Method

The present study was undertaken to evaluate the impact of kindergarten education upon boys and girls of the same chronological age by determining the relative effects of a year of maturation and

incidental out-of-school learning experience versus the effects of exposure to existing kindergarten programs on growth of language and readiness skills as measured by the Illinois Test of Psycholinguistic Abilities (ITPA) Experimental Edition, and the Metropolitan Readiness Tests (MRT).

A total of 182 children, 93 boys and 89 girls, who were participants in the Collaborative Perinatal Research Project and were born at the University of Minnesota Hospitals between September 1 and December 31 were tested during the summer immediately preceding their fifth birthday with the Illinois Test of Psycholinguistic Abilities (11) and the Metropolitan Readiness Test (Hildreth, Griffiths & McGovern, 1965). The tests were individually administered by trained educational examiners. Subjects were retested with the same instruments one year later, during the summer preceding their sixth birthday. In the course of the intervening year, 76 of these children, 40 boys and 36 girls, attended kindergarten and 106 children, 53 boys and 53 girls did not attend kindergarten.

Kindergarten attendance or non-attendance was based primarily on policies of local school districts regarding the establishment of kindergarten classes and the setting of age limits for school entrance. Those subjects who attended kindergarten resided in school districts which routinely permitted kindergarten entrance for all children who reached the age of five within the calendar year in which they enrolled in school. The subjects who did not attend kindergarten were excluded because they chanced to reside either in a school district which did not conduct kindergarten

classes or in a district which did not allow children to enter kindergarten unless their fifth birthday occurred prior to September 1 of the year in which they were enrolled.

Subjects were located in 61 different school districts in the state of Minnesota. In only 12 of these districts did children within the age range under investigation attend kindergarten. These twelve districts included the cities of Minneapolis and St. Paul as well as eight of their adjacent suburbs. Two children attended kindergarten in small communities outside the metropolitan area. Of the 106 children who did not attend kindergarten, 68 resided within the Twin Cities metropolitan area and 38 were located in small towns and rural communities throughout the state.

Since kindergarten attenders and non-attenders differed in place of residence there existed the possibility of concomitant differences in socioeconomic levels which have been demonstrated to exert an influence on response to pre-school programs (Bereiter & Englemann, 1966). For this reason, a socioeconomic index score was computed for the family of each subject based on interview data obtained when the pregnant mother first became a participant in the Collaborative Perinatal Research Project. A composite numerical index was derived by averaging scores on three socioeconomic variables: education, occupation of head of household, and total family income. Thus the higher the index score the higher the socioeconomic level of the family (Myrianthopoulos & French, 1968).

As may be seen in Table 1, the distributions of socioeconomic index scores for the four groups of subjects were very similar. The scores of kindergarten (K) boys and no-kindergarten (N-K) boys were virtually identical while the upper and lower quartile scores o

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TABLE 1. Socioeconomic Index Scores of Kindergarten and No-Kindergarten Subjects

	Boys		Girls	
	Kindergarten (N = 40)	No Kindergarten (N = 53)	Kindergarten (N = 36)	No Kindergarten (N = 53)
Q_3	70	70	77	70
Mdn.	63	57	58	53
Q_1	37	37	43	33
Range	05-99	10-93	13-93	05-90

the kindergarten (K) girls were slightly elevated when compared to the remaining three groups.

The Metropolitan Readiness Tests were designed to measure the extent to which children have developed such skills and abilities as auditory and visual perception, motor coordination, linguistic skills, knowledge of numbers and ability to pay attention and follow directions, all of which contribute to readiness for initial first grade work.

The Illinois Test of Psycholinguistic Abilities consists of the following nine subtests each designed to measure a specific aspect of psycholinguistic ability:

1. auditory decoding - comprehension of spoken words
2. visual decoding - comprehension of pictures and printed words
3. auditory-vocal association - simple verbal analogies
4. visual-motor association - knowledge of meaningful relationships between pictured objects and symbols
5. vocal encoding - expressing ideas in spoken words
6. motor encoding - expressing ideas with gestures
7. auditory-vocal automatic - use of grammatical rules in predicting linguistic events
8. auditory-vocal sequencing - digit span
9. visual-motor sequencing - placing a series of picture symbols in original order of presentation from memory

Results

The statistical analysis was conducted separately by sex using Metropolitan Readiness Test raw scores and the Illinois Test of

Psycholinguistic Abilities Language Age scores. Initial (pre-test) mean scores of the kindergarten and no-kindergarten groups on the Metropolitan and the Illinois Test of Psycholinguistic Abilities test were compared by an analysis of variance procedure reported in Tables 2 and 3. While there were no differences between pretest scores of kindergarten and no-kindergarten girls on the Metropolitan, significant pretest differences favoring kindergarten over no-kindergarten boys did occur on the Alphabet subtest ($p < .01$) as well as Metropolitan Total Score ($p < .05$).

On the Illinois Test of Psycholinguistic Abilities pretest (Table 3) kindergarten boys scored significantly higher ($p < .05$) than no-kindergarten boys on Visual Decoding while kindergarten girls had a significant advantage ($p < .05$) over no-kindergarten girls on Auditory Decoding. Since initial differences did exist between kindergarten and no-kindergarten subjects on one or more subtests of each measure, the analysis of posttest scores for all subjects was done by analysis of covariance using the initial score on each variable as the covariate.

The prevailing view that kindergarten girls are more ready for school than are boys of the same chronological age was supported by the finding at the time of initial testing, prior to kindergarten entrance, that consistent differences favoring both groups of girls over both groups of boys occurred on five of the six Metropolitan Readiness Test subtests and seven out of nine Illinois Test of Psycholinguistic Abilities subtests as well as on total scores for both measures.

TABLE 2. Comparison of Kindergarten and No-Kindergarten Mean Metropolitan Readiness Test Pre-test Raw Scores

	Boys			Girls		
	Kindergarten	No Kindergarten	P	Kindergarten	No Kindergarten	P
Word Meaning	5.65	4.77	.107	6.11	5.49	.173
Listening	6.30	4.81	.035	7.28	6.79	.470
Matching	2.48	2.17	.572	4.25	3.23	.103
Alphabet	3.23	1.57	.007**	4.86	3.68	.203
Numbers	4.25	3.47	.178	6.44	5.00	.082
Copying	.35	.34	.966	1.83	1.17	.138
Metropolitan Total	22.15	17.13	.037*	30.78	25.23	.062

* $p < .05$

** $p < .01$

TABLE 3. Comparison of Kindergarten and No-Kindergarten Mean Illinois Test of Psycholinguistic Abilities Pre-Test Language Age Scores*

	Boys			Girls		
Measure	Kindergarten	Kindergarten	P	Kindergarten	Kindergarten	P
Auditory-Vocal Automatic	56.08	52.04	.173	56.14	57.08	.775
Visual Decoding	60.23	53.57	.042†	62.75	58.32	.172
Motor Encoding	51.68	51.92	.962	47.53	46.91	.834
Auditory-Vocal Association	55.68	52.55	.316	60.94	56.81	.140
Visual-Motor Sequencing	50.73	51.98	.644	56.42	54.00	.413
Vocal Encoding	54.03	60.00	.258	58.58	57.21	.750
Auditory-Vocal Sequencing	59.30	59.19	.974	58.17	60.83	.462
Visual-Motor Association	50.23	47.68	.465	57.00	55.09	.604
Auditory Decoding	58.80	56.83	.600	72.08	62.40	.021†
Illinois Test of Psycholinguistic Abilities Total Score	55.00	52.81	.285	58.69	56.30	.236

* Language Age Scores converted to total months

† P <.05

Table 4 presents adjusted mean posttest scores of kindergarten and no-kindergarten subjects on the Metropolitan Readiness Test. Significant differences favoring kindergarten over no-kindergarten boys were found on Metropolitan Total Raw Scores and on the Matching, Numbers, and Copying subtests (all $p < .01$). Kindergarten girls scored significantly higher ($p < .01$) than no-kindergarten girls on only one subtest, Copying. Adjusted mean Illinois Test of Psycholinguistic Abilities posttest scores of kindergarten and no-kindergarten subjects are portrayed in Table 5. Kindergarten boys scored significantly higher on five subtests (all $p < .01$) as well as on total language age ($p < .001$). There were no significant differences between the two groups of girls on total language age nor on eight of the nine subtests. On one subtest, Visual-Motor Association, there was a significant difference ($p < .05$) favoring kindergarten girls.

Discussion

Not only do the sexes differ in language and readiness skills prior to kindergarten entrance but results of this study indicate that kindergarten programs have a differential impact upon the growth of these skills in the two groups. While girls were more advanced at the pre-kindergarten level, boys derived the greatest relative benefits from kindergarten education. For girls the effects of kindergarten attendance on the skills measured were negligible. Maturation and incidental out-of-school learning resulted in as great an increase in these skills as did exposure to kindergarten programs.

TABLE 4. Analysis of Covariance of Metropolitan Readiness Test Post-test Raw Scores

	Adjusted Mean Scores					
	Boys			Girls		
Measure	Kindergarten	Kindergarten	P	Kindergarten	Kindergarten	P
Word Meaning	8.19	7.48	.251	8.32	8.04	.566
Listening	8.06	8.07	.991	9.23	8.37	.094
Matching	6.02	4.15	.002**	7.12	6.00	.110
Alphabet	6.23	4.92	.097	7.72	7.36	.661
Numbers	10.06	7.59	.005**	11.25	9.70	.078
Copying	3.94	1.95	.0003**	5.46	3.76	.005**
Metropolitan Total	41.59	34.67	.006**	47.53	43.87	.154

** p <.01

TABLE 5. Analysis of Covariance of Illinois Test of Psycholinguistic Abilities Post-test Language Age Scores*

	Adjusted Mean Scores					
	Boys			Girls		
Measure	Kindergarten	Kindergarten	P	Kindergarten	Kindergarten	P
Auditory-Vocal Automatic	68.25	66.42	.519	72.94	70.83	.493
Visual Decoding	72.16	71.84	.919	69.30	68.34	.769
Motor Encoding	65.94	58.80	.055	61.30	57.42	.253
Auditory-Vocal Association	74.34	65.86	.0001††	74.03	74.36	.885
Visual-Motor Sequencing	68.45	60.55	.008††	69.11	64.81	.136
Vocal Encoding	74.26	63.01	.007††	78.03	71.94	.113
Auditory-Vocal Sequencing	70.40	67.19	.179	69.58	67.92	.482
Visual-Motor Association	70.09	59.29	.003††	71.09	61.69	.014†
Auditory Decoding	78.68	67.81	.002††	75.47	75.68	.955
Illinois Test of Psycholinguistic Abilities Total Score	70.08	64.24	.0001††	70.02	68.46	.303

*Language Age Scores converted to total months

† $p < .05$

†† $p < .01$

Interpreting these data from a developmental frame of reference suggests the possibility that kindergarten activities serve to stimulate growth in the school readiness and language areas if made available during the appropriate developmental period. While it would appear that girls in this study has passed the particular stage of skill development for which these activities would have been appropriate, the boys were apparently at a suitable developmental level to benefit from exposure to these experiences.

Support for this hypothesis of interaction between developmental readiness and education programs may be derived from a study by Smith (1968) who examined Peabody and Stanford-Binet scores of poverty area children at the completion of a pre-kindergarten program and found that boys who attended pre-school scored no differently than boys who did not, while girls who attended pre-school scored significantly higher than those who did not.

An explanation for the apparent contradiction between Smith's results and those of the present study may be found in the socio-economic and age differences between the samples involved. While subjects in the Smith study were poverty-area children with a mean chronological age of 5-1 at completion of the pre-school programs, those in the present study are more normally distributed over the socioeconomic scale with an average age of 6-1 at the time of posttest administration.

It may well be that the girls in both studies were ready to develop the abilities measured by the various instruments during the year preceding kindergarten entrance if they received a necessary amount of stimulation and input from their every-day experiences.

Since the more middle-class girls may be expected to derive such input from their normal home and neighborhood environments (Bereiter & Engelmann, 1966), they arrived at kindergarten with their school readiness skills relatively well developed while the poverty-area girls in an environment less oriented toward language skills and school readiness activities were more dependent upon pre-school classroom experiences to support their development. Thus, it may be hypothesized that the girls in both studies were developmentally ready for such skill and language development at the earlier age, prior to kindergarten entrance, needing only the appropriate environmental stimulation. It may be that for middle-class subjects stimulation was available in the home, but for poverty-area subjects stimulation was available mainly in the preschool.

Due to the developmental-maturational lag for boys at these same ages they may not have been ready for rapid skill and language development at the pre-school age and therefore did not benefit measurably from pre-school attendance. However, they were developmentally ready to benefit from kindergarten experiences given an additional year of maturity as in the present study.

Conclusion

These findings, together with prior investigations yielding differential results for boys and girls on a variety of educational measures (Bentzen, 1963), offer evidence of a need to re-evaluate educational goals and programs designed for children in their early school years.

The time is long overdue for heeding recommendations for the establishment of flexible school entrance and promotion policies

in place of rigid chronological age requirements (Pauly, 1959; Jones, 1969; Lincoln, 1927; Pauly, 1951) as a first step in accomodating the broad range of individual differences present at the outset of the school years.

On the basis of available research evidence (Kagan, 1964; McCarthy, 1964; Davidson & Lang, 1960), it is reasonable to hypothesize that sex differences encompass more than a simple time differential on a single developmental continuum; that instead there exist a number of sex differences in biosocial development which need to be acknowledged and provided for within the school setting. Further investigation is necessary to determine whether more drastic changes such as differential curricula, providing primary grade teachers of both sexes, or even establishment of separate classes for boys (Le Triplett, 1968) might be a more optimal means of providing for these differences.

Footnotes

[1]This study, "The Collaborative Project for the Study of Cerebral Palsy, Mental Retardation, and other Neurological and Sensory Disorders of Childhood", is a major investigation in twelve medical centers of the antecedents of neurologically related childhood disorders. At each hospital, all pregnant women who came for care were encouraged to participate in the study. The University of Minnesota Hospitals' sample is comprised of families of graduate students, welfare clients, and middle class private patients, with the former two groups predominating.

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